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Evaluating Health Status and Nutrition Education Intervention for Primary School Children

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Abstract: **nutritional education programs in school settings were shown to concomitantly increase the children's knowledge and decrease the risk malnutrition. The aim of the present study was to evaluate health status and nutrition education intervention for primary school children. Design: Quasi experimental design was used to achieve the aim of the current study. Setting and Sample: Simple random sample was used to select two primary schools in Beni-Suef City; one governmental school and one private school, the sample included 115 children their ages ranged from 10 to12 years old, 15 children dropped out during implementation phase of the program. Tools; I- an interviewing questionnaire composed of two parts; socio-demographic characteristics and school children knowledge about nutrition (pre/post-test), II- Observational checklist include two parts: Checklist to assess studied children for manifestations of malnutrition and dietary intake checklist to assess frequency of dietary intake for different nutrients/ week. III- Anthropometric measurements used to assess nutritional status of the students. The main results of the present study: It showed that most studied children had low frequency of dietary intake for different nutrients/ week (<4 times/week) except grains. higher percentage of them suffered from manifestations of malnutrition. The prevalence of malnutrition among studied children was 31%; 7% of them were overweight, 11% underweight, 19% wasted and 8% were stunted. Conclusion: there was a significant improvement in students' knowledge about nutrition after implementing nutrition education intervention. Socio-demographic factors had significant effect on the prevalence of malnutrition among school children. Recommendation: Scale up community based interventions are needed to reduce the prevalence of malnutrition especially for school age children.**

Keywords: **Nutrition, education intervention, primary school children, associated factors.**

1. INTRODUCTION

Adequate nutrition is essential during childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development **(United Nations Children's Fund (UNICEF), World Health Organization (WHO) & The World Bank, 2012).** On the other hand, inadequate nutrition intake has important implications because malnutrition has been shown to negatively affect the cognitive development of primary school children **(Galal et al., 2005)**. Nutritional status has a major impact on children's survival mainly due to the synergistic relationships between malnutrition and diseases **(De Onis, Blossner & Borghi, 2012)**. The causes of childhood malnutrition are diverse, multidimensional, and interrelated. An analytical framework suggested by UNICEF categorizes the causes into (a) immediate causes: inadequate dietary intake and illness, (b) underlying causes: insufficient access to food in a household; inadequate health services and unhealthy environment; and inadequate care for children and women at the household level, and (c) basic causes: insufficient current and potential resources at societal level (**De Onis et al., 2012**).

Malnutrition is still a major health problem in Egyptian community among different age groups and socio-economic classes **(WHO, 2010)**.The causes of nutrition problems in Egypt are a function of many factors: most households are food insecure because of low income, high food prices and low local agricultural production, in addition to poor dietary practices due to lack of awareness, and inadequate health service provision capacities (**World Bank, 2010**).

There are also the problems of environmental pollution and food safety challenges due to lack of enforcement of existing laws. There is an overarching health system challenge that derives from uncoordinated and disjointed planning of nutrition activities; often leading to sub-optimal use of resources and impact on nutrition status.**(Mucha, Blomberg and Stockdale, 2016).**

The two main anthropometric indicators used to define malnutrition– stunting, and wasting or thinness– represent different histories of nutritional insult to the child. Linear growth retardation (chronic malnutrition or stunting) is frequently associated with repeated exposure to adverse economic conditions, poor sanitation, and the interactive effects of poor nutrient intakes and infection. Low weight-for-height or low body mass index (BMI) for age (acute malnutrition, wasting or thinness) is generally associated with recent illness and/or food deprivation **(United Nations System Standing Committee on Nutrition, 2010)**.

Stunting and wasting are wide spread among school age children in developing countries **(Druck, 2010)**. High levels of stunting among children suggest that there will also be a long term deficit in mental and physical development that leaves children unable to take maximum advantage of learning opportunities in schools. Epidemiological evidences suggest a strong link between maternal and early childhood under nutrition and increased adult risk of various chronic diseases. Poor nutrition in childhood, in turn, is associated with adverse life-course health, chronic diseases, and lower cognitive performances **(Sanchez-Villegas et al., 2010; Kalarchian & Marcus, 2012).**

Teaching children about healthy nutrition when they are young may help prevent the adverse outcomes. **(Wanders et al., 2011; Nyaradi et al., 2013)**. Previous studies emphasize the need for nutrition education interventions in school-aged children and more high-quality research to assess nutritional status in this age group **(Hu et al., 2010; Nemet, Geva and Eliakim, 2011)**. Many findings support the need for common knowledge about health habits and behaviors during early childhood and track into adulthood include food choice patterns, levels of physical activity, and sedentary behaviors **(Ohly et al., 2013; Gubbels, Van Assema & Kremers, 2013)**. On the same line **Abdelaziz et al., (2015)** reported that the prevalence of malnutrition among school going students in Beni-Suef Governorate in Egypt can be reduced by increasing awareness regarding the nutritional intake of the student.

Nurses who work with children and young people have an important role in identifying whether children are at risk of malnutrition and monitoring it, because high-risk children need a comprehensive nutritional assessment. They make screening, or undertaking a nutritional trigger assessment, and implement nutrition education program for children and their families **(Schaffer, Anderson, and Rising, 2016).**

2. SIGNIFICANCE

More than 146 million children are suffering from malnutrition in developing countries. About 17% of children in Middle East and North Africa are malnourished **(Janevic et al., 2010)**. In Egypt, malnutrition disorders affect more than 30% of school children. This problem appears to be largely attributable to poor dietary quality and micronutrient deficiencies **(Galal et al., 2005)**. The 2008 DHS data shows that both forms of malnutrition (over and under nutrition) are prevalent in Egypt amongst youth. Young adults tend to be affected largely by over nutrition. Five percent of males aged 10 – 19 years are under weight and the same proportion is overweight. Similar proportions of overweight were observed in girls; six percent were overweight. Some (15 percent of males and 19 percent of females) of these young people are at risk of becoming obese. The prevalence of stunting in Egypt is 29 percent their BMI values fell below the 5th percentile on the age and sex-specific BMI growth charts **(El-Zanaty and Way, 2009)**.

Yet now, school-age children are not commonly included in health and nutrition surveys and an up-to-date overview of their nutritional status across the world is not available **(Ara et al., 2011)**. If interventions are not carried out, it is estimated that close to one billion children will be physically and mentally impaired by 2020 **(Levels and trends in child mortality report 2011)**.

Aim of the study:

To evaluate health status and nutrition education intervention for primary school children

Hypotheses:

- The students' knowledge improves after receiving nutrition education intervention than before.
- The socio-demographic factors affect the rate of malnutrition among primary school children.

3. METHODOLOGY

Research design:

Quasi experimental design was used to achieve the aim of the current study.

Research Setting:

Beni-Suef is one of the governorates of Egypt, situated in the center of the country, located about 120 km south of Cairo, on the west bank of the Nile River. It includes, 8 cities, 39 rural local units annexed by 222 villages (71.4% rural, 28.6% urban). It has an area of 10,954 km2 and estimated population of 2,597,000 individual that constitutes 3.2% of total population in Egypt. School students aged 5 - 18 years (1,488,500) constitute 57.3% of total population in Beni-Suef Government **(Central Agency of Public Mobilization and Statistics (CAPMAS) (2011).**

The study was conducted at two primary schools in Beni-Suef City. One governmental primary school (Abo bakr El Sedek school) and one private school (Khatem Al-Morsaleen school).

Research Sample:

Simple random sample was used to select two schools from total 43 primary schools (34 governmental and 9 private schools), the sample included 115 children their ages ranged from 10 to 12 years old selected from the two schools under the study (from total 60 child from governmental and 55 from private school). 15 child dropped out during implementation of the program.

Tools of Data collection: To achieve the aim of the study, data was collected by the following tools:

I- Interviewing questionnaire was used to collect data and include two parts

1- The first part was designed to assess socio demographic data of school children include sex, birth order, parents' education and occupation, family size, and family income.

2- The second part was designed to assess school children knowledge about nutrition (pre/posttest) which include: definition of malnutrition, vulnerability, effects, importance of balanced diet, barriers for good nutrition, and prevention of malnutrition.

Scoring system:

Correct answer was scored 1, and incorrect answer was scored 0. The total scores was calculated as follow: < 60% was considered unsatisfactory, and ≥ 60% was considered satisfactory knowledge.

II- Observational checklist include two parts:

1-Checklist for manifestations of malnutrition filled by researcher to assess health status of school age children as general appearance of child, teething health, hair condition, face, gums, skin, tongue, nails and lips.

Scoring system:

Healthy observed items were scored 1 and unhealthy one was scored 0.

According **Dudek (1997**), the total score of malnutrition is categorized as the following; < 5 manifestations → the child have good health status, 5- <10 manifestations → the child have satisfactory health status, 10-<15 → the child have unsatisfactory health status, and if the child have ≥15 manifestations → then have bad health status.

2- Dietary intake checklist filled by students' mothers to assess frequency of dietary intake for different nutrients/ week to vegetables, animal proteins, dairy products, eggs, fruits and grains.

Scoring system

It was categorized as follow: if the frequency of dietary intake for different nutrients of the child less than 4 times per week scored 0, and if the frequency 4 -7 times per week scored 1.

III- Anthropometric measurements:

Anthropometric measurements to assess nutritional status of the students. The researcher checked the scale for accuracy, weight was measured to the nearest 0.1 kg with an electronic scale with students wearing light clothing and without shoes. Student height was measured to the nearest 0.1 cm with a wooden stadiometer placed on a flat surface. Weight, height, and age data were used to calculate z-scores (**WHO and UNICEF, 2009**) using the WHO Anthroplus software (Version 10.4, 2010) **(Blössner et al., 2010).** Wasted children defined as weight-for age z-score (WAZ) < −2 SD & severe thinness: z-score <-3SD, stunting defined as height-for age z-score (HAZ) < −2SD, and malnourished students aged more than 10 years: defined as body mass index for age (BMI/A) z-score [+2SD (obese)] **(World Food Program, 2010)**.

Approval:

Official permission was obtained first from the director of educational region. Then permission was taken from the directors of the selected schools to collect the data. A full explanation about the aim of the study was explored.

Ethical considerations:

The study was conducted with careful attention to ethical standards of research and rights of participants. Oral consent was taken from each child and their mothers, they were informed that the data collected will be used for the research only, and confidentiality manner is assured.

4. DATA COLLECTION PROCEDURE

- The period of data collection and implementation of the education intervention from beginning of March 2015 to end of May 2015.

Tools developments: tools were developed by the researcher after reviewing the literature to collect the necessary data. The tool **validity** test was done through five expertises. They were Faculty members of Community Health Nursing Department and Pediatric Nursing Department and necessary modifications were done. Cronbach'salpha test was used to measure the internal consistency **reliability** of the questionnaire (0.83).

Pilot study: A pilot study was carried out on 10% (10 students) to test the content of the questionnaire as well as to estimate the time needed for data collection and the necessary modifications was done. Those who shared in the pilot study were excluded from the study sample.

- The researcher visited the schools during working times (from 9Am to 1pm), two times per week The pretest questionnaires took from 15-30 minutes to be completed.
- Observational checklist for dietary intake distributed and collected within one week through the assessment phase.
- And the program was implemented through 4 sessions each session took about 30-45 minutes.
- Post-test was done immediately after intervention to evaluate the effect of the program to improve awareness of school children about nutrition.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 19 (Statistical Package for Social Studies) created by IBM, Illinois, Chicago, USA. For numerical values the range mean and standard deviations were calculated. The differences between two mean values were used using student's t test. For categorical variable the number and percentage were calculated and differences between subcategories were tested by chi square test. When chi

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square was not found appropriate, fisher exact test and Monte Carlo exact test were used. The level of knowledge between governmental and private schools before and after intervention was tested suing Mann-Whitney test. Meanwhile the level of knowledge within each type of schools before and after intervention was tested using Wilcoxon's singed ranks test. The level of significant was adopted at $p<0.05$. stature and BMI (W/H2) across sex and age groups. The z-scores of (+2SD).

5. RESULTS

Table 1: shows that there are statistically significant differences between socio-demographic characteristics and type of school among studied children except in gender, father' job and residence.

Table 2:reveals that higher percentage of studied children have manifestations of malnutrition, the most affected are; teeth, lips, gums, nails, general appearance, and eyes. The percentages of malnutrition' manifestations among studied children are higher among students of governmental than private school except teeth and gum.

Table 3: indicates that there is statistically significant difference between total score of malnutrition and type of school among studied children. The data reveals that 40.0% of studied children in private school have satisfactory health status compared to 16.0% of children in governmental school. high percentage of governmental school students have unsatisfactory health status (56.0%) compared to 34.0% for children in private school.

Table 4: shows that most studied children have low frequency of dietary intake for different nutrients/week (<4 times/week) except grains. Frequency of dietary intake among studied children in private school higher than studied children in governmental school in different nutrients except vegetables. There is a statistically significant difference between frequency of dietary intake and type of school in vegetables and animal proteins.

Figure 1: illustrates that 31% of studied children are malnourished; 7% overweight, 11% underweight, 19% wasted and 8% of them are stunted.

Table 5: illustrates that there is significant improvement in students' knowledge about nutrition after implementing nutrition education intervention.

Table 6: indicates that there is no significant relation between socio-demographic factors and total knowledge score after intervention.

Table 7:demonstrates that there are statistically significant relations between socio-demographic factors and prevalence of malnutrition. The data reveals that the prevalence of malnutrition high among children who are; in governmental school, females, high birth order, low parents education level, their fathers' job are manual workers and housewives' mothers, have big family size, and not enough family income.

Table (1): Socio-demographic characteristics and type of school among studied children

Characteristics	Governmental (n=50)		Private (n=50)		Total (n=100)	X^2	P
	N	%	N	%			
Gender						1.073	0.300
Males	29	58	34	68	63		
Females	21	42	16	32	37		
Birth order:						MCET	0.001*
First	15	30.0	21	42.0	36		
Second	1	2.0	18	36.0	19		
Third	22	44.0	3	6.0	25		
Fourth	10	20.0	8	16.0	18		
Fifth	2	4.0	0	0.0	2		
Mothers' educational levels:						14.441	0.002*
Illiterate	10	20.0	15	30.0	25		
Primary	20	40.0	12	24.0	32		
Secondary	19	38.0	11	22.0	30		
University	1	2.0	12	24.0	13		

Fathers' educational levels:						17.285	0.001*
Illiterate	3	6.0	12	24.0	15		
Primary	23	46.0	11	22.0	34		
Secondary	21	42.0	14	28.0	35		
University	3	6.0	13	26.0	16		
Fathers' job:						2.828	0.243
Employee	25	50.0	20	40.0	45		
Manual workers	22	44.0	22	44.0	44		
Others	3	6.0	8	16.0	11		
Mothers' job:						MCET	0.001*
Housewives	37	74.0	28	56.0	65		
Employee	13	26.0	9	18.0	22		
Manual worker	0	0.0	6	12.0	6		
Others	0	0.0	7	14.0	7		
Family size:						8.507	0.004*
3-5	25	50.0	39	78.0	64		
>5	25	50.0	11	22.0	36		
Residence:						0.794	0.373
Rural	12	24.0	16	32.0	28		
Urban	38	76.0	34	68.0	72		
Monthly income:						MCET	0.001*
Enough and saving	30	60.0	48	96.0	78		
Just enough	8	16.0	1	2.0	9		
Not enough	12	24.0	1	2.0	13		

*Significant

Table (2): Distribution of studied children in relation to manifestations of malnutrition and type of school

Manifestations of malnutrition	Governmental (n=50)		Private (n=50)		Total (n=100)	X^2	P
	N	%	N	%			
General appearance	32	64.0	30	60.0	62	0.170	0.680
Hair	24	48.0	23	46.0	47	0.040	0.841
Face	30	60.0	23	46.0	53	1.967	0.161
Eyes	36	72.0	21	42.0	57	9.180	0.002*
Lips	41	82.0	29	58.0	70	6.857	0.009*
Tongue	31	62.0	25	50.0	56	1.461	0.227
Teeth	32	64.0	41	82.0	73	4.110	0.043*
Gums	29	58.0	35	70.0	64	1.563	0.211
Nails	33	66.0	30	60.0	63	0.386	0.534
Skin	25	50.0	17	34.0	42	2.627	0.105
Limbs and nervous system	16	32.0	2	4.0	18	13.279	0.001*
Feeling fatigue with rest	26	52.0	18	36.0	44	2.597	0.107
Can't play with peers	10	20.0	3	6.0	13	4.332	0.037*
Loss of appetite	14	28.0	5	10.0	19	5.263	0.022*
Feeling fatigued with exertion	15	30.0	1	2.0	16	14.583	0.001*
Lack of concentration	20	40.0	19	38.0	39	0.042	0.838
Low school achievement	16	32.0	5	10.0	21	7.294	0.007*
Blurred vision	5	10.0	3	6.0	8	0.543	0.461
Headache	25	50.0	16	32.0	41	3.348	0.067
Delayed wound healing	20	40.0	19	38.0	39	0.042	0.838

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Table (3): Distribution of studied children according their health status

Health status	Governmental (n=50)		Private (n=50)		Total (n=100)
	N	%	N	%	
Good health status	0	0.0	2	4.0	2
Satisfactory health status	8	16.0	20	40.0	28
Unsatisfactory health status	28	56.0	17	34.0	45
Bad health status	14	28.0	11	22.0	25
P	0.001*				

Table (4): Distribution of studied children by type of school and frequency of dietary intake of different nutrients

Variables	Governmental (n=50)		Private (n=50)		Total (n=100)	X^2	P
	n	%	N	%			
Vegetables						5.828	0.016*
<4 times/week	34	68.0	44	88.0	78		
4-7 times/week	16	32	6	12.0	22		
Animal proteins						9.013	0.003*
<4 times/week	44	88.0	31	62.0	75		
4-7 times/week	6	12.0	19	38.0	25		
Dairy products						0.170	0.680
<4 times/week	32	64.0	30	60.0	62		
4-7 times/week	18	36.0	20	40.0	38		
Eggs						1.604	0.205
<4 times/week	36	72.0	30	60.0	66		
4-7 times/week	14	28.0	20	40.0	34		
Fruits						1.624	0.202
<4 times/week	43	86.0	38	76.0	81		
4-7 times/week	7	14.0	12	24.0	19		
Grains						FE	1.000
<4 times/week	2	4.0	1	2.0	3		
4-7 times/week	48	96.0	49	98.0	97		

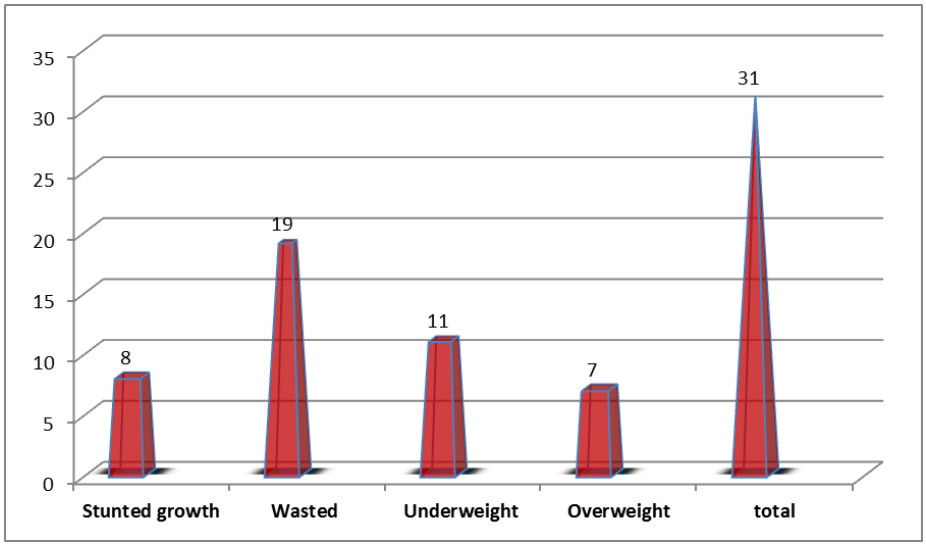

Figure (1): Prevalence of malnutrition among studied children

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Table (5): Distribution of studied children by their satisfactorily level of knowledge about nutrition and type of school

Satisfactory level of knowledge (>60%)	Governmental (n=50)		Private (n=50)		Total (n=100)	Z	P
	n	%	n	%			
Definition of malnutrition							
Before	29	58.0	31	62.0	60	0.406	0.685
After	47	94.0	47	94.0	94	0.000	1.000
Z	4.234		4.000				
P	0.001*		0.001*				
Vulnerability to malnutrition							
Before	13	26.0	9	18.0	22	1.183	0.237
After	48	96.0	46	92.0	94	1.439	0.150
Z	5.699		5.789				
P	0.001*		0.001*				
Effects of malnutrition:							
Before	9	18.0	8	16.0	17	0.809	0.419
After	50	100.0	46	92.0	96	1.013	0.311
Z	6.139		6.084				
P	0.001*		0.001*				
Importance of balanced diet							
Before	9	18.0	5	10.0	14	2.429	0.015*
After	48	96.0	48	96.0	96	1.703	0.089
Z	6.056		6.036				
P	0.001*		0.001*				
Barriers for good nutrition							
Before	3	6.0	4	8.0	7	0.691	0.490
After	39	78.0	43	86.0	82	1.036	0.300
Z	5.889		5.850				
P	0.001*		0.001*				
Prevention of malnutrition							
Before	0	0.0	0	0.0	0	0.338	0.735
After	50	100.0	42	84.0	92	5.193	0.001*
Z	6.194		6.192				
P	0.001*		0.001*				
Total satisfactory knowledge score							
Before	0	0.0	0	0.0	0	0.000	1.000
After	50	100.0	49	98.0	99	4.297	0.001*
Z	6.171		6.164				
P	0.001*		0.001*				

*Significant

Table (6): Distribution of studied children by their socio-demographic factors and total knowledge score after intervention

Socio-demographic factors	Total knowledge score (Mean+SD)	t	p
Type of school:		1.564	0.121
Governmental	8.64+3.13		
Private	7.74+2.59		
Gender		0.425	0.672
Males	8.10+2.97		
Females	8.35+2.81		
Birth order:		0.869	0.387

1-2	8.42+3.03		
>3	7.91+2.73		
Fathers' education:		0.503	0.616
Low education (illiterate/primary)	8.04+2.83		
High education (secondary/university)	8.33+2.98		
Mothers' education:		0.127	0.899
Low education (illiterate/primary)	8.16+2.86		
High education (secondary/university)	8.23+2.98		
Fathers' job:		1.00	0.920
Employees	8.22+3.20		
Others	8.16+3.65		
Mothers' job:		1.481	0.142
Housewives	7.88+3.10		
Others	8.77+2.41		
Family size:		0.275	0.784
3-5	8.25+2.90		
>5	8.08+2.93		
Family monthly income		0.560	0.518
Enough and saving	8.09+2.85		
Enough/not enough	8.55+3.11		

Table (7): the relation between socio-demographic factors and prevalence of malnutrition

Socio-demographic factors	**Well- nourished (n=69)**		**Malnourished (n=31)**		**X^2**	**P**
	N	**%**	**N**	**%**		
Type of school						
Governmental	32	64.0	18	36.0	1.169	0.280
Private	37	74.0	13	26.0		
Gender					0.469	0.493
Males (63)	45	71.4	18	28.6		
Females (37)	24	64.9	13	35.1		
Birth order:						
1-2 (55)	43	78.2	12	21.8	4.8172	.028*
>3 (45)	26	57.8	19	42.2		
Fathers' education:						
Low education (illiterate/primary) (49)	29	59.2	20	40.8	4.3283	.037*
High education (secondary/university) (51)	40	78.4	11	21.6		
Mothers' education:						
Low education (illiterate/primary) (57)	30	52.6	27	47.4	16.6039	.0001*
High education (secondary/university) (43)	39	90.7	4	9.3		
Fathers' job:						
Employees (45)	36	80.0	9	20.0	4.6283	.0314*
Manual worker & Others (55)	33	60.0	22	40.0		
Mothers' job:						
Housewives (65)	40	61.5	25	38.5	4.8338.	.0279*
Employees (35)	29	82.9	6	17.1		
Family size:						
3-5 (64)	49	76.7	15	23.4	4.7533	.0292*
>5 (36)	20	55.6	16	44.4		
Family monthly income						
Enough and saving (78)	66	84.6	12	15.4	40.417	< .00001
Enough/not enough (22)	3	13.6	19	86.4		

**Significant*

6. DISCUSSION

Malnutrition among school-age children is due to inadequacies in one or more of the three main preconditions for good nutrition: food, care and health. Interventions for school age children can supplement efforts to reduce levels of malnutrition in the adulthood (**Brauchla et al., 2012)**. Therefore the present study aimed to evaluate health status and nutrition education intervention for primary school children

The current study results revealed that high percentage of studied children were affected by manifestations of malnutrition, the most affected were teeth, lips, gums, nails, general appearance, and eyes. Most of them had unsatisfactory or bad health status. In the same line **Shivaprakash and Joseph (2014)** studied nutritional status of rural school-going children (6-12 Years) of Mandya district, they found that the hair changes were seen in 19 (3.9%). Eye changes noted in the form of conjunctival xerosis in 100 (20.7%) and bitot's spots in 10 (2.1%). Teeth changes were noted in the form of dental caries in 137 (28.3%) and enamel mottling in 19 (3.9%). Skeletal changes were noted in 7 (1.4%) children. Flat nails or koilonychia were noted in 57 (11.8%). These results supported by **Srivastava et al., (2012)** in study about nutritional status of school-age children in India, they reported that most of the school-age children had a poor nutritional status.

The current study results showed that low percentages of children had high frequency of dietary intake (4-7 times/week) to vegetables, animal proteins, dairy products, eggs, fruits except grains took high frequency of intake/ week. Similarly **Mwaniki & Makokha (2013)** studied nutrition status and associated factors among children in public primary schools in Kenya, they demonstrated that malnourished children had significantly higher incidence of morbidity, inadequate calorie intake, and inadequate variety of foods (less than 4 groups). These findings in accordance with the results of **Ministry of Health (2015)** mentioned that the contribution of the cereal food group fell far below the recommendation of food based dietary guidelines of 55%. The current study findings were also similar to those of the 1999 micronutrient survey, which reported a relatively low consumption of fruits in Kenya **(Jayatissa, Gunathilaka and Fernando, 2012).**The low percentages of children had high frequency of dietary intake might be due to low socioeconomic status, or lack of knowledge about healthy diet.

The present study findings showed that the percentages of children who had high frequency of dietary intake (4-7 times/week) regarding to animal proteins, dairy products, eggs, fruits and grains in private school than governmental. On the other hand **El-Sabely, Tork and Hussien, (2013)** studied nutritional status and dietary habits of children from public and private primary schools in Zagazig city, Egypt, they mentioned that there was no difference between the students in public and private schools regarding the consumption of vegetables, carbohydrates and milk, the statistically significant differences were detected regarding the consumption of meat and fruits; perhaps it may be a reflection of the economic strength of the family.

The present study results indicated that about one third of studied children were malnourished; 7% overweight, 11% underweight, 19% wasted and 8% of them were stunted. These results had a lower prevalence of stunting and underweight than in the study carried out in Zambia among school children where 28.9% were stunted and 14.5% were underweight **(Gillespie & Kadiyata, 2004)** and lower than results of **Mwaniki & Makokha (2013)** who mentioned that the overall prevalence of stunting stood at 24.5% and underweight rate was (14.9%) whereas the prevalence of wasting was low (9.7%). On the same line **Malpani et al., (2014)** studied prevalence of malnutrition among school children in rural area of North Karnataka region in India, and found that the level of stunting and underweight in school children as per percentile standards from the WHO. Most of the boys and girls of the study fall under <3rd percentile. Hence, malnutrition was significantly higher among the school children.

In the same context **Herrador et al., (2014)** in a cross-sectional study of malnutrition and associated factors among school aged children in rural and urban settings of Fogera and Libo Kemkem districts, Ethiopia, they showed that the prevalence of stunting among school-aged children was 42.7% in rural areas and 29.2% in urban areas, while the prevalence of thinness were 21.6% and 20.8%. Also **Mekonnen, Tadesse and Kisi, (2013)** stated that the prevalence of malnutrition was high among school children aged six to fourteen years old the overall prevalence of stunting, underweight and thinness were 243 (30.7%), 96 (59.7%) and 294 (37.2%). The differences in the prevalence of malnutrition might be due to the difference in food choice pattern, levels of physical activity, and level of socio-economic status.

The current study results denoted that there was a significant improvement in students' knowledge about nutrition after implementing nutrition education intervention. Similarly **Lakshman et al. (2010)** studied a novel school-based intervention to improve nutrition knowledge in children in England, they reported that the mean total nutrition knowledge score increased after intervention. These results in agreement with results of **Joulaei et al., (2013)** who aimed to assess the effects of nutritional intervention based on advocacy approach on malnutrition status among school-aged children in Shiraz, they revealed that The pre- and post-test education assessment in both groups showed that the student's average knowledge score has been significantly increased from 12.5 ± 3.2 to 16.8 ± 4.3 ($P < 0.0001$).

These findings supported by study results of **Keshani et al., (2016)** who studied the effects of a nutrition intervention on nutrition knowledge in Iran, they reported that nutrition education interventions increase nutritional knowledge among school children.

The present study demonstrated that there were statistically significant relations between socio-demographic factors and prevalence of malnutrition, the risk factors associated with malnutrition were: birth order, parents educational level, mothers' job and family size. These findings were in accordance with **Adegun, Ajayi-Vincent and Alebiosu (2013)** who studied differences in the nutritional status of young school children from public and private owned primary schools in Ekiti state, Nigeria, concluded that nutritional status is significantly related to income and educational background of the parents. In the same context, these results were in agreement with **Nabag (2011)** who conducted their studies in Sudan among the same age group and reported that Mothers' educational level as important underlying determinants that directly or indirectly cause malnutrition among children. In the same line **Abdelaziz et al., (2015)** reported in their study about nutritional status and dietary habits of school children in Beni-Suef Governorate, Egypt, identified risk factors associated with malnutrition for those aged more than 10 years were: mother education (P-value = 0.03), father education (P-value = 0.04) and family size (P-value = 0.014).

In Sub-Saharan Africa, **Abubakar et al., (2012)** carried out study on prevalence and risk factors for poor nutritional status among children, they showed that various indicators of social economic status have been associated with children's nutritional status, such as maternal and paternal educational level, parental income, and family assets.

7. CONCLUSION

There was a significant improvement in students' knowledge about nutrition after implementing nutrition education intervention. Socio-demographic factors had significant effect on the prevalence of malnutrition among school children, the prevalence of malnutrition higher among children who were; in governmental school, females, high birth order, low parents education level, their fathers' job are manual workers and housewives' mothers, have big family size, and not enough family income.

8. RECOMMENDATIONS

- There is a great need for further high-quality researches to provide the data regarding nutritional status of different age group.
- The idea of nutrition corners needs to be explored as part of improving coverage of nutrition services.
- Scales up community based interventions are needed to reduce the prevalence of malnutrition especially for school age children.

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